FLAG SMUT OF WHEAT AND ITS CONTROL

IMPERIAL BUREAU
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OF MYCOLOGY

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FLAG SMUT, a destructive disease of wheat, was found in 1919 near Granite City, Madison County, Ill. In 1920 the disease was found in 111 fields, confined to 47 square miles.

Flag smut causes considerable annual loss in Australia and is known to occur in Japan, India, and South Africa.

Black stripes running lengthwise in the leaves and leaf sheaths are typical of flag smut. Diseased plants are stunted and rarely head.

The disease is spread by spores carried on the seed and by spores left in the field on infected plant material or on the ground, where they may be scattered in various ways and infect wheat seedlings in the fall.

To control flag smut, treat with formaldehyde the infested grain as it comes from the thrasher. Burn infested straw. Sow disease-free seed on non-infested land. Treat with copper sulphate and lime the seed wheat to be sown in the infested area. Grow resistant varieties.

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FLAG SMUT OF WHEAT recently has been introduced into the United States through some unknown means. The very destructive nature of the fungus, together with the numerous possibilities for its spread, makes it highly important that every wheat farmer have some knowledge of the disease and the means of prevention and how to control it in case his fields become infested.

DISTRIBUTION OF FLAG SMUT.

The first reports of the disease in the United States came from the vicinity of Granite City, Madison County, Ill., in 1919, at which time a number of fields in that locality were found to be infested. During the season of 1920 an extensive survey was made of the wheat fields in the vicinity of Granite City, and flag smut was found in 111 fields, comprising 2,500 acres, in an area of about 47 square miles.

Flag smut has long been known in the wheat-growing sections of Australia, where each year it causes considerable loss. The damage commonly is not very great, though sometimes it amounts to 10 to 25 per cent of the wheat crop. The disease is known also in Japan, India, and South Africa.

SYMPTOMS.

Black stripes running lengthwise in the leaf blades and sheaths are typical of flag smut (figs. 1 and 2). The disease is commonly more injurious to the upper leaves of the plant. These black stripes are due to the spores produced by the fungus. The stems also are infected to some extent. Infected plants usually are more or less dwarfed, and they rarely head out or produce seed. Usually all the stalks on a diseased plant are smutted, but occasionally one or more stalks show no infection.

DISSEMINATION.

Flag smut is spread in two ways. Perhaps the most important method is through smut spores that cling to the seed. In thrashing, the spores are knocked out of diseased leaves and scattered over the grain. When the grain is sown and germinates, the adhering spores also germinate, the germ tube penetrates the young wheat seedling, grows upward through its tissues, and appears in the spring as smut stripes in the wheat leaves.

FIG. 1.—Wheat plant showing black stripes on the leaves caused by flag smut.

The other method of spread is by means of spores in the soil, which come from infected straw, stubble, and fragments of plants left on the ground when the wheat is cut. Spores also are blown out of the separator to nearby land when the grain is thrashed. Spores on the ground may be carried for long distances by wind and running water. These spores germinate in the soil and if near enough to a seed may infect the young wheat seedling in the same way as those clinging to the seed. It is not known how long the spores may live in the soil, but it is hoped that they do not persist over winter.

CONTROL.

The United States Department of Agriculture and the Illinois State Department of Agriculture have taken steps, cooperatively, to prevent the spread of

flag smut beyond the quarantined area in Madison County and to eradicate it, if possible, from the infested district. The measures agreed upon to accomplish these two purposes are as follows:

(1) Thorough treatment of all grain with formaldehyde as it comes from the separator, using 1 pound of formaldehyde in 3 pints of water for 25 bushels of grain.

(2) Burning all straw in the quarantined area as soon as possible after thrashing.

(3) Sowing no wheat on infested land and, so far as possible, sowing no wheat on land which grew wheat the previous year.

(4) Obtaining seed from localities known to be free from flag smut.

(5) Treatment by the copper-sulphate or bluestone method of all seed to be sown. This consists in dipping the grain for 10 minutes in a solution of bluestone (1 pound of bluestone to 5 gallons of water) and then dipping in a solution of lime (1 pound to 10 gallons of water). The advantage of this treatment is that the seed remains coated with the bluestone and lime, and this coating protects it to a large extent from infection by spores present in the soil.

(6) Growing varieties that, so far as known, are highly resistant to flag smut.

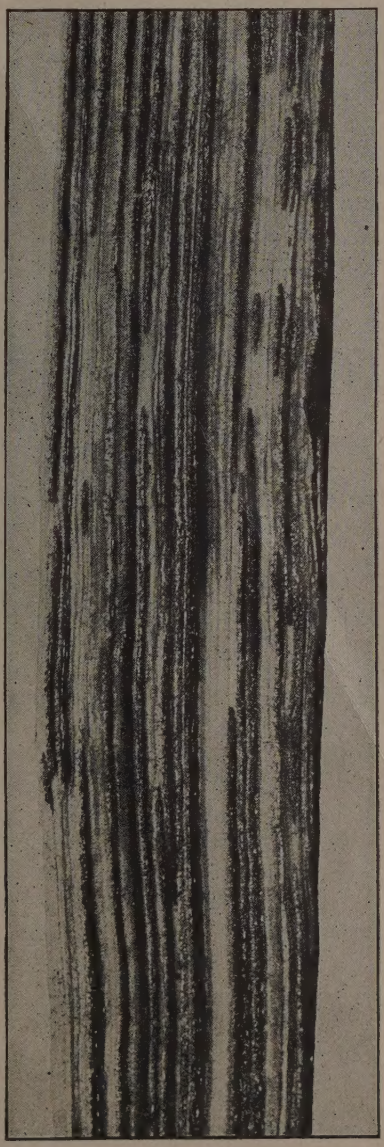

FIG. 2.—Part of a wheat leaf (enlarged), showing flag-smut stripes.

VARIETIES OF WHEAT RESISTANT TO FLAG SMUT.

The United States Department of Agriculture and the Illinois Agricultural Experiment Station are conducting experiments to determine the resistance of wheat varieties to flag smut. A large number of varieties have been tested, and the experiments are being continued. Some promising results have been obtained. Certain varieties of wheat are more or less resistant to the attacks of the disease.

Although none of the good-yielding wheats are known to be entirely immune from it, the difference between some of the very susceptible and the slightly susceptible varieties is marked and is certainly worth considering in selecting seed wheats. Not all resistant varieties are good producers in the locality where flag smut has appeared. In Fulcaster, Gipsy, Red Wave, Turkey Red, and Early May wheats we have a combination of disease resistance and good yielding ability. These wheats are strongly recommended for use in the flag-smut district of Madison County.

Although Red Wave is listed as one of the desirable varieties because it yields well and is highly resistant to flag smut, it has the reputation of being very poor in milling and baking qualities.

Certain other varieties, even though their adaptability to conditions in the American bottoms is beyond question, should not be grown under any consideration in the infested area, because of their susceptibility to the disease. The most outstanding among these are Red Cross, the so-called Salzer Prize Taker, Salzer Pride, Dawson Golden Chaff, Fultz, Illini Chief, and Jones Winter Fife. A great many other varieties have been grown in the flag-smut plats, but because of not being well adapted to the locality or because of disease susceptibility they are not mentioned here.

The United States Department of Agriculture, the Illinois State Department of Agriculture, and the Illinois Agricultural Experiment Station are aiding farmers in every way possible to eradicate this destructive wheat pest. Formaldehyde, with expert assistance, is furnished for treating the thrashed grain at the separator. Bluestone and lime, with expert assistance, are furnished to every farmer in the treatment of seed for fall sowing. About 15,000 bushels of seed wheat were treated for farmers in the infested district in Illinois in the autumn of 1920. It is planned to equip a number of separators in the locality with special fans, which are expected to remove a large percentage of smut from the grain and also to prevent to some extent its being blown out broadcast from the separator to surrounding fields.

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